- 1 1. A method for making an epitaxial germanium temperature sensor, comprising:
- depositing an epitaxial germanium layer onto a substrate by chemical vapor deposition 2
- 3 (CVD); and
- doping the layer during the vapor phase of the CVD process to a dopant concentration 4
- selected so that at temperatures below about 4K, resistivity of the layer is due to hopping 5
- 6 conduction of free carriers.
- 7 2. The method of claim 1, wherein the epitaxial germanium layer is deposited to a thickness of 2 microns.
- 3. The method of claim 1, wherein the doping step includes doping the epitaxial germanium with arsenic (AsH₃).
- 2 ... 10 ... 11 4. The method of claim 1, wherein the doping step includes doping the epitaxial germanium with arsenic compensated with boron (AsH₃/B₂H₆).
- 12 13 14 5. The method of claim 1, wherein the substrate is selected from a group consisting of silicon, germanium, sapphire and diamond.
- 15 The method of claim 1, wherein the depositing step creates an epitaxial germanium layer 6.
- 16 having a thickness in the range from about 450 angstroms to about 500 microns.
- 17 7. The method of claim 1, wherein the depositing step creates an epitaxial germanium layer
- 18 having a doped hetero-epitaxial layer.
- 19 8. The method of claim 7, wherein said doped hetero-epitaxial layer is selected from a
- 20 group consisting of an epitaxial layer of germanium on silicon, an epitaxial layer of germanium
- 21 on carbon, and an epitaxial layer of germanium on an insulating material.
- 22 9. The method of claim 1, wherein the dopant in the doping step comprises a donor selected
- 23 from a group consisting of arsenic (AsH₃), phosphorus and antimony.

- 1 10. The method of claim 3, wherein said arsenic (AsH₃) has a concentration of 2.0x10¹⁶ cm⁻³.
- 2 11. The method of claim 4, wherein the dopant in the doping step has an arsenic
- 3 concentration of $2.0 \times 10^{16} \text{ cm}^{-3}$ and a boron concentration of $7.2 \times 10^{16} \text{ cm}^{-3}$.
- 4 12. The method of claim 1, wherein the dopant in the doping step has a donor concentration
- 5 that makes said layer of epitaxial germanium resistive.
- 6 13. The method of claim 1, wherein the dopant in the doping step comprises a compensating
- 7 acceptor impurity selected from a group consisting of boron and gallium.